English translation of JP 10-279705

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The diffracted-light study component characterized by preparing the height or the cavity in the core on the front face of a lens in the diffracted-light study component which has a lens operation.
[Claim 2] A height or a cavity is a diffracted-light study component according to claim 1 currently visually formed in the detectable configuration by the optical magnifying device.
[Claim 3] The diffracted-light study component according to claim 2 with which the maximum angle of inclination of a height or a cavity is set as the include angle beyond the include-angle value computed from the following formula.
The maximum angle of inclination of theta> 7/(n-1) however theta:height, or a cavity, n: Refractive index.
[Claim 4] The bottom aspect product of a height or a cavity is a diffracted-light study component according to claim 1 to 3 set to less than 10% of the area of the 1st zona orbicularis of a diffraction grating.
[Claim 5] The diffracted-light study component according to claim 1 to 4 currently fabricated by the metal mold by which cutting was carried out with a diamond chip.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the diffracted-light study component which has a lens operation, and the so-called diffraction mold lens, and relates to the diffracted-light study component in which highly precise positioning is possible especially.
[0002]
[Description of the Prior Art] There are what was fabricated by pattern on which diffraction structure acts as prism, a thing which acts as a lens in a diffracted-light study component. Among these, the diffracted-light study component which has a lens operation is called the diffraction mold lens, and is used as a taking lens which requires compensation of chromatic aberration.
[0003] This diffraction mold lens occurs the lens operation which incident light converges on one point, and is emitted from one point by the diffraction phenomena which the regular pattern of a diffraction grating with which the refractive index of media, such as glass and light transmission nature resin, and the surface profile were formed in the lens front face unlike the conventional lens which has optical effect gives to incident light. Therefore, the regular pattern of the diffraction grating formed in the front face of a diffraction mold lens is calling the diffraction grating nearest to the central point the 1st zona orbicularis, and a call, the following, the 2nd zona orbicularis and 3rd zona-orbicularis -- from the relation which has spread in the shape of a concentric circle focusing on one point.
[0004] Although a diffraction mold lens is producible with injection shaping, etching processing, or laser beam machining which used the resin molding die, generally it is adopted from having the advantage to which injection shaping is rich in mass-production nature. In recent years, cutting for which manufacture of the metal mold used for this injection fabricating method used the diamond tool, and the so-called diamond turning are used widely.
[0005] Although 0 will be approached so that the peripheral velocity at the time of cutting of a concentric circle-like diffraction pattern becomes close to a core when producing metal mold by this diamond turning, change of the peripheral velocity of such a diamond tool becomes a cause, and a projection configuration or a cavity configuration occurs inevitably in a metal mold core. Conventionally, the height or cavity generated in the core of this diffraction mold lens was processed so that it could not check by looking, or cutting had removed it so that the lens engine performance might not be influenced.
[0006] By the way, the conventional diffraction mold lens is positioning the lens optical axis in production processes, such as a camera, at the process with which a lens holder is equipped using optical magnifying devices, such as a microscope. This positioning approach makes the image itself obtained by the 1st through a camera lens match with the pattern set up beforehand, and sets a lens optical axis by the 2nd on the basis of the fit tolerance of a lens outer diameter.
[0007]
[Problem(s) to be Solved by the Invention] However, by the conventional approach of the above 1st which makes the image itself obtained through a camera lens match with the pattern set up beforehand, since the image is materialized with two or more lenses which constitute a camera

lens, an image formation location has constraint that distance arises, and it was made difficult that this equipped a proper location.
[0008] Moreover, by the conventional approach of the above 2nd which sets a lens optical axis on the basis of the fit tolerance of a lens outer diameter, in some of which the target-position precision of a lens system is required by altitude, since it will be necessary to position by measuring a lens location, there is a trouble that a routing makes it complicated. namely, the time of equipping an electrode holder with a lens -- the maximum -- although an important thing is making it correspond to the power of a lens, since it is making make a lens outer diameter match and becomes alignment indirect as a result in order to double with power, it is not avoided by this 2nd approach that location precision falls.
[0009] This invention was made in view of the above-mentioned trouble, and it aims at offering the diffracted-light study component which aimed at improvement in the accuracy of measurement of the lens itself while it realizes highly precise positioning, when equipping a lens holder with this lens by preparing a height or a cavity in the core of a diffraction mold lens.
[0010]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, it enables it to use this height or a cavity as alignment of a core, and criteria of measurement in this invention in the diffracted-light study component which has a lens operation as what prepared the height or the cavity in the core on the front face of a lens.
[0011] In the above-mentioned configuration, said height or cavity can make visual detection easy by forming in a detectable configuration visually with optical magnifying devices, such as a microscope. In this case, the maximum angle of inclination of a height or a cavity becomes detectable visually by setting it as the include angle beyond the include-angle value computed from theta> 7/(n-1), when the maximum angle of inclination of a height or a cavity is set to theta and the refractive index of a lens is set to n.
[0012] Moreover, if the bottom aspect product of a height or a cavity is 10% or less of the area of the 1st zona orbicularis of a diffraction grating, not influencing an optical function is checked experimentally. Furthermore, since a height or a cavity is what is generated inevitably in a production process in the case of the metal mold by which cutting was carried out with a diamond chip, as for the diffracted-light study component of this invention which considers a height or a cavity as an indispensable configuration, fabricating with this metal mold is desirable.
[0013]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing. Drawing 1 shows the central part of the diffraction mold lens as a diffracted-light study component concerning this operation gestalt. Diffraction mold lens 1a shown in this drawing is a molding lens which consists of light transmission nature resin, and many diffraction gratings 21 and 22 -- are formed in one side in the shape of a said alignment. These diffraction gratings 21 and 22 -- The whole cross-section configuration is formed in the so-called blaze (Blaze) configuration which presents the configuration which a right angled triangle follows. Moreover, the central region 3 which becomes in the diffraction grating 21 of the 1st zona orbicularis is formed in the shape of the spherical surface, and height 4a of a cone configuration is formed in the core, i.e., lens core, of this central region 3.
[0014] As for the above-mentioned operation gestalt, drawing 2 shows the central part of diffraction mold lens 1b of another gestalt. Although diffraction mold lens 1b shown in this drawing is also a resin molding lens, with this operation gestalt, many diffraction gratings 21 of a blaze configuration and 22 -- are formed in both sides of a lens in the shape of a said alignment. Moreover, cavity 4b of a reverse cone configuration is formed in the core of the spherical-surface-like central region 3 of lens both sides.
[0015] In addition, although this invention has the description at the point that height 4a or cavity 4b is prepared in the core on the front face of a lens, since the function of height 4a and the function of cavity 4b are substantially equivalent, diffraction mold lens 1a which has hereafter height 4a shown in drawing 1 is explained.
[0016] molding of the diffraction mold lens which showed drawing 3 to drawing 1 -- public funds -- the condition at the time of processing of a mold is shown. A mold and 6 are the diamond

tools as a cutting tool for cutting with which processing equipment (not shown) was equipped. this drawing -- setting -- 5 -- production by the side of a diffraction grating 21 and 22 -- public funds -- While the rotation drive of the metal mold 5 is carried out by the mechanical component (not shown) of processing equipment in the direction of arrow-head t in a shaft center at the time of processing Motion control of the diamond tool 6 is carried out to X shaft orientations and Y shaft orientations which are shown by the cross arrow head, and grid configuration 2a1 -- corresponding to the blaze mold diffraction grating 21 and 22 -- is formed in the processed field of metal mold 5 of cutting actuation of this diamond tool 6.

[0017] A diamond tool 6 is what constituted the point of a cutting tool body with a diamond chip, and when processing the diffraction-grating configuration of a blaze mold conventionally, it is made the optimal. With this operation gestalt, about 3 micrometers of about 0.5-micrometer acute cutting tools are preferably used for several micrometer order and a concrete target for the radius at the Rth page of the tip of a chip at the maximum. Moreover, since an iron system ingredient has strong chemical affinity with the carbon which is a cutting tool's 6 material and it is unusable although an iron system ingredient can be considered as a component of metal mold 5 when using a diamond tool 6 in this way, what performed non-electrolyzed nickel plating to the front face is suitably used by using an iron system ingredient as a base material.

[0018] And profile 4aa of main height 4a of metal mold 5 is easily processible by carrying out very small delivery in the direction of Y in addition to the profile which produces blaze grid configuration 2a1 --. Thus, in diffraction mold lens 1a with the need of processing it from the cutting tool 6 with small tip curvature, especially, since formation of height 4a of profile 4aa is easy, if diffraction mold lens 1a is fabricated with the metal mold 5 by which cutting was carried out using the diamond tool 6, in the production process of metal mold 5, profile 4aa of height 4a can produce very easily.

[0019] Height 4of diffraction mold lens 1a a is formed for the purpose of the thing of a diffraction grating 21 and 22 -- for which the core of a concentric circle-like pattern is defined, therefore this operation gestalt takes being visually formed in a detectable configuration to this height 4a by using the optical magnifying device of microscope level. Thus, by making height 4a appear to extent from which viewing becomes easy under a microscope etc., this height 4a can be used as a criteria location of alignment of a lens core, or measurement, and wearing to the lens holder mentioned later etc. can be performed with high precision.

[0020] Drawing 4 shows the configuration of height 4a in diffraction mold lens 1a fabricated using the metal mold 5 of the above-mentioned configuration. Moreover, drawing 7 has illustrated conventionally cavity 4b' of the inconvenient gestalt produced on the occasion of metal mold production. Generating of cavity 4b of the lens core shown in drawing 7 is produced according to the following processes.

[0021] That is, in the case of cutting by the diamond tool, as compared with a circumference region, peripheral velocity becomes slow as mentioned above in a lens central region. By difference of this working speed, height 4a or cavity 4b' is generated, when configuration precision does not come out. However, in the former, since it was a main important matter to produce so that height 4a or cavity 4b' may not arise as much as possible in a lens core, as for a diamond tool, the radius of the chip tip R section is using the thing of about 1mm and a major diameter, therefore a height or a cavity does not become an extremely acute configuration. And since the configuration which surged loosely is presented like cavity 4b' shown in drawing 7 , visually, it cannot check.

[0022] On the other hand, since the diamond tool 6 with it is used in creating the molding die 5 of this diffraction mold lens 1a in height 4a in diffraction mold lens 1a of this operation gestalt shown in drawing 4 , it becomes processible [height 4a which can be viewed]. [a small tip radius and] [acute as mentioned above] The synthetic configuration which others, a semi-sphere, or a point presents a partial spherical-surface configuration to, and a pars-basilaris-ossis-occipitalis side presents a cone configuration as a configuration of this height 4a can be considered. [form / above-mentioned / cone]

[0023] Conditions for this height 4a to become the configuration which can be viewed under a microscope etc. are decided by the maximum include angle of the inclined plane of height 4a.

That is, if the inclination of the light when carrying out incidence to height 4a sets the maximum angle of inclination of height 4a to theta (radian) and a refractive index is set to n, it will be decided mostly (n-1) by theta.

[0024] If light spreads about four FNo now and it will assume that light of an angle of inclination cannot go into an eye easily, 7-degree light should just bend and it will have become clear that there should just be n= 1.5, then angle-of-inclination theta 14 degrees or more. Therefore, if maximum angle-of-inclination theta of height 4a is set as the include angle beyond the include-angle value computed from the following formula, viewing of it under a microscope etc. will be attained.

Maximum angle-of-inclination theta can be obtained with the above-mentioned formula also about theta> 7 / (n-1) cavity 4b shown in addition in drawing 2 .

[0025] Moreover, it can be said that it will not influence an optical function if the bottom aspect product of height 4a is less than 10% of the area area surrounded by the diffraction grating 21 of the 1st zona orbicularis. That is, it is common to fall [of a diffraction grating 21 and 22 --] about 10 to 15% with the production precision of a grid, although effectiveness is 100% on count on design wavelength, and it can be said that it is tolerance if the effect on the optical function by height 4a being formed is also less than 10%.

[0026] Drawing 5 shows the condition of equipping a lens holder with diffraction mold lens 1a of this operation gestalt using a microscope. In this drawing, 7 is a microscope and 8 is a lens holder. When positioning this lens 1a within a lens holder 8 so that the optical axis L of lens 1a which has a diffraction-grating side may be set, height 4a is used as a target of a center position. It becomes easy to decide the center position of lens 1a on a lens holder 8 under a microscope 7 by this, and highly precise positioning can be performed. Moreover, after doubling height 4a with a core on a lens holder 8 and making it in agreement with an optical axis L, the circumference of this lens 1a is fixed to a lens holder 8 by technique, such as adhesion.

[0027] Drawing 6 shows the example which measured the diffraction mold lens produced according to this operation gestalt with the sensing-pin type measurement machine. The diffraction mold lenses shown in this drawing are diffraction gratings 21 and 22. -- The height of a blaze is about 1 micrometer. Thus, although a measurement error will arise if in the case of the lens equipped with the minute diffraction grating 21 and 22 -- the measurement needle of a sensing-pin type measurement machine does not measure it as it passes along a lens core correctly Since it is easily judged whether they are whether it was measured by the existence of detection of the measurement needle having contacted this height 4a when height 4a existed in a core through the lens core, and no also when performing such measurement, exact measurement is attained.

[0028]

[Effect of the Invention] Since the height or the cavity should be prepared in the core on the front face of a lens of a diffracted-light study component when being based on this invention, as explained above, positioning at the time of equipping a lens holder with a diffracted-light study component, using this height or a cavity can be performed easily. Moreover, it faces measuring the lens configuration of a diffracted-light study component, and since it becomes the criteria of whether the height or the cavity could measure correctly and no, the outstanding effectiveness which is not looked at by the former is demonstrated -- configuration measurement can be performed with a sufficient precision.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view showing the central region of the diffraction mold lens with which the diffraction grating was formed in one side as a diffracted-light study component concerning 1 operation gestalt of this invention.
[Drawing 2] The sectional view showing the central region of the diffraction mold lens with which the diffraction grating was formed in both sides as a diffracted-light study component concerning other operation gestalten of this invention.
[Drawing 3] molding of the diffraction mold lens shown in drawing 1 -- public funds -- the important section enlarged drawing showing the condition at the time of processing of a mold typically.
[Drawing 4] The important section enlarged drawing showing the configuration of a height.
[Drawing 5] Drawing showing the condition of equipping a lens holder with a diffraction mold lens using a microscope.
[Drawing 6] Drawing showing the example which measured the diffraction mold lens with the sensing-pin type measurement machine.
[Drawing 7] The important section enlarged drawing showing an example of the cavity of the conventional inconvenient gestalt.
[Description of Notations]
1a Diffraction mold lens
1b Diffraction mold lens
21, 22 -- Diffraction grating
2a1 -- Diffraction-grating configuration of metal mold
3 Central Region of Diffraction Mold Lens
4a Height
4b Cavity
5 Metal Mold
6 Diamond Tool
7 Microscope
8 Lens Holder

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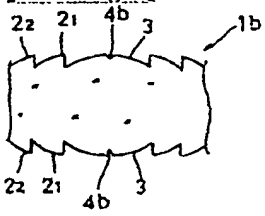
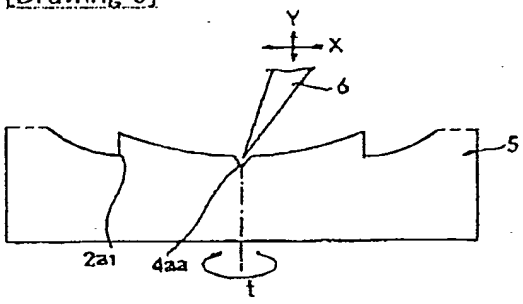
DRAWINGS

[Drawing 1]

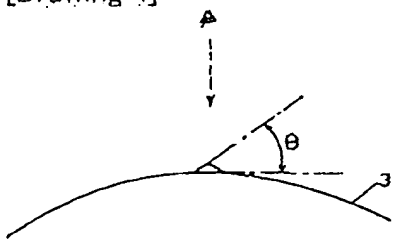
[Drawing 2]



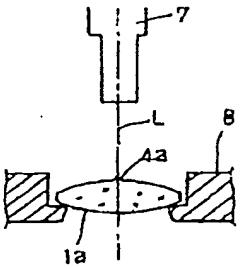
[Drawing 3]



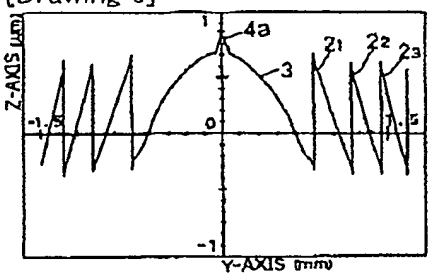
[Drawing 4]



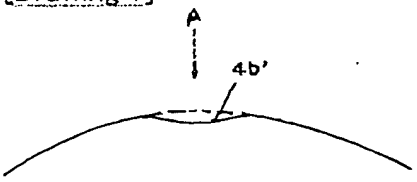
[Drawing 5]



[Drawing 6]



[Drawing 7]



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